HUNGRY RIDGE SILVICULTURE SPECIALIST REPORT

Scope of Analysis

This section considers the effects of the Hungry Ridge Rehabilitation project alternatives on the vegetation resource.

The proposed project and direct and indirect effects analysis area consists of the Hungry Ridge project area of 29,973 acres. The direct and indirect effects analysis timeframe is the one year immediately following the conclusion of each project activity.

The cumulative effects analysis area is also comprised of the 29,973-acre project area. The timeframe for the cumulative effects analysis extends from the last 15 years to the present, and 15 years into the future after project work is completed.

Analysis Methods and Indicators

Analysis Methods

This analysis relies on a comparison of current existing conditions, anticipated conditions under the no-action and action alternatives, and desired conditions at various scales.

To obtain the **existing condition**, VMAP data, a Forest Service Northern Region source of vegetation mapping based on satellite data, was collected and classified using the Region One Vegetation Council Existing Forested Vegetation Classification System. Polygons of like vegetation were recognized, created, or re-identified through the current USFS compartmental mapping system. VMAP data was supplemented with field-collected Common Stand Exam plot data and qualitative field assessments. Other data sources for analysis of the existing vegetation condition include aerial photo interpretation with ground verification during field site visits, annual Forest Health Protection (FHP) aerial detection surveys, field reviews by FHP specialists in 2013, the Forest Service Activity Tracking System (FACTS) database, and the Forest Service Geographic Information System (GIS) database.

In addition, project area existing conditions are described by Vegetation Response Units (VRUs), as defined in the South Fork Landscape Assessment for the Nez Perce National Forest (SFLA 1998). VRU designation is a land classification and mapping system that delineates units of land according to the natural vegetation that occupies forest sites. VRUs indicate the historic disturbance regime and vegetation that would occur following ecological disturbances. VRUs, which serve as land units and are easily classified, can be used to discuss successional patterns and development. The vegetation groups used are those developed by Applegate et al (1993) for northwestern Montana and northern Idaho. VRUs are used to interpret historic and existing condition and trend in plant community composition, structure, and process, but lack the ability to provide age ranges for the vegetation communities.

The vegetative **desired condition** for the Hungry Ridge project area was developed prior to any effects analysis. It is based on multiple resource objectives using direction from the 1987 Nez Perce Forest Plan and the Vegetation Response Unit (VRU) and Ecological Reporting Unit (ERU) information from the Nez Perce Forest South Fork Landscape Assessment (SFLA, 1998). VRU information in the SFLA was compiled using aerial photo interpretation and satellite imagery. ERUs are subunits (geographical areas) within the larger South Fork of the Clearwater SubBasin.

Indicators

Indicators of vegetative characteristics were analyzed to measure alternative effectiveness at meeting the desired forest conditions identified in the Purpose and Need for Action, comparing effects between the existing condition and proposed activities from three action alternatives. Fire suppression, forest succession, and timber harvest have resulted in declines in open pine stands, increases in grand fir and Douglas-fir, and losses of patch size diversity and snags since pre-settlement times (SFLA, 1998). Changes in **forest cover types** (timber species) and **forest structure** (tree size class) are used as indicators to quantify effects of the alternative actions on the current existing vegetation.

1) *Forest Cover Types (timber species)*: The indicator of forest composition is the percent of the total forest cover type dominated by the long-lived shade-intolerant early-seral species (western larch and ponderosa pine), compared to the area dominated by shade-tolerant species (grand fir, subalpine fir, Engelmann spruce, and Douglas-fir).

2) *Forest structure (tree size class)*: The indicator of forest structure is percentage of the project area forest composition by tree size class. Larger trees of the preferred species are desirable in the amounts described in the "Desired Conditions" section below. Current structural stage distributions are due to insect and disease activity, fires activity and fire suppression, and timber harvest.

Affected Environment and Environmental Consequences

Forest Resource Concerns

Healthy forests with ecological resilience – Healthy forests can be considered ecological processes that support biological compositions and structures that are within their natural range of variability, resulting in the capability of the ecosystem to be resilient to natural disturbance regimes over time. A lack of disturbance (natural fire) across the landscape over the past 80-100 years has degraded the resiliency of the ecosystems, resulting in an increase of tree diseases and insect infestations beyond endemic levels. Specifically, root disease infections in grand and Douglas-fir have significantly increased. Also, an endemic level of insect infestation has induced tree damage and above-normal mortality levels from bark beetles in many of the mixed-conifer stands. The increase in insect- and disease-induced disturbance and mortality has resulted in high fuel loadings within the project area. The lack of fire disturbance has also contributed to a species composition shift toward shade-tolerant, late-seral conifers such as grand fir and Douglas-fir in many stands. The dense forested conditions are not conducive to the growth, vigor, and healthy conditions that propagate shade-intolerant tree species such as western larch and ponderosa pine. These species are desirable because of their relative resilience to fire and their lower susceptibility to root disease. Historically, they were more prevalent and dominant under the natural, more-frequent fire disturbance regime (Smith, J.K. and W.C. Fischer, 1997).

In general, this project is designed to reduce high fuel loadings that are a result of increased insect and disease disturbance across the project landscape and within the Wildland Urban Interface (WUI) designation of the Hungry Ridge project area, thereby promoting forest health and resilience. Healthy forests with ecological resilience facilitate sustainable management, and provide a broad range of ecosystem services including fire/fuels, wildlife, recreation, aquatics, and commodity production. Healthy, resilient landscapes have greater capacity to survive natural disturbances and large-scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing demand for human use.

Specifically, this project is designed to reduce high fuel loadings, increase resilience to insects and diseases, and promote forest stand health by:

- Removing vegetation to raise crown-base heights and reduce crown bulk density, thus reducing the threat from high-intensity crown fires;
- Reducing ground and ladder fuels;
- Designating fuel and harvest treatments to promote conditions where future understory fire can be used on 15- to 25-year intervals to reduce ground and ladder fuels;
- Designing and designating harvest treatments to maintain existing and reestablish long-lived early-seral species such as western larch and ponderosa pine, which have declined significantly over the last 80 years due primarily to a lack of disturbance (Arno et al. 2000, Keane and Arno 1993).

The existing stand conditions present a challenge in meeting concurrent Forest and project goals including maintaining mature forest canopy, promoting early-seral trees species that can tolerate under-burning, enhancing resilience to disturbances, preventing fuel accumulation over time, providing for valuable habitat structures, and providing an appropriate level of timber productivity. Currently, a large portion of this area is comprised of mixed-conifer stands where root disease is pervasive, especially in Douglas-fir and grand fir. Indian paint fungus, a tree trunk rot, is also common in grand fir. Bark beetle attacks, including mountain pine beetle, Douglas-fir beetle, and fir engraver beetle, have also resulted in tree mortality in forest stands throughout the project area (Zambino, Pederson, and Von Helmuth USDA, 2013). Across the landscape, treatments are proposed to reduce crown density, raise crown-base height, reduce ground and ladder fuels, and promote early-seral species, while not accelerating the spread of root disease after harvest in susceptible species. This will require a variable approach to tree removal, ranging from regeneration harvest to variable-density thinning. This approach will target the removal of dead and dying trees and root- and stem-rot-infected trees (primarily Douglas-fir and grand fir). Stand density will be reduced by removing trees to reduce ladder fuels and reduce potential for crown fires. At the fine scale, accomplishment of this resilient forest mosaic will require regeneration harvest in some stands to remove dead and dying trees, followed by reforestation of desirable species through natural or artificial methods (planting), to achieve the long-term forest stand composition and structure goals. To the extent available, healthy shade-intolerant reserve trees would be left to provide structural diversity, future snags, and incidental seed. In other areas, a variable-retention intermediate harvest can be designed to remove insect- and disease-affected trees, and lower residual tree density while retaining the healthiest and generally largest shade-intolerant trees available in an uneven distribution. Scattered openings (0.5-3 acres in size) will occur in disease pockets; however, these openings are inconsequential in the context of the overall forested stand. In the short-term, a patchy single-storied condition is desirable in these areas to lower fire risk and enhance mature tree health to the extent feasible. Over time, some natural regeneration may occur in canopy gaps. This, along with repeated maintenance burning, will slowly begin to diversify stand structure in the long-term.

Promotion of these structures is consistent with providing a sustainable level of timber production over time by 1) replacing those stands which have culminated in growth or are no longer viable due to insects and diseases, and reforesting them with desirable species; and 2) improving the structure and composition of healthy, mature trees to enhance their ability to withstand natural disturbance, provide mature habitat in the short-term, and retaining the best trees, which will provide products in the future.

Existing Conditions

The forest vegetation of north-central Idaho displays strong diversity in both composition and structure. This diversity is attributable to climate, geology, and disturbance patterns (insects, disease, fire history, and extreme-weather events). These elements combine to create some of the most varied forest communities found in the Inland Northwest. Existing forest types occurring in the Hungry Ridge project area include cold subalpine fir/whitebark pine, cool Engelmann spruce/grand fir, moderately-dry to moist mixed conifer, and dry ponderosa pine/Douglas-fir. Most previously-unmanaged stands range from approximately 100 -120 years of age, originating after stand replacement fires in 1889 (14,717 acres) and 1919 (8,797 acres) (Delimata 2012). Some stands have legacy trees to 275 years of age. Many older trees exhibit multiple fire scars (>24" ponderosa pine, grand fir).

Existing tree species include grand fir, Douglas-fir, Engelmann Spruce, lodgepole pine, ponderosa pine, western larch, subalpine fir, and whitebark pine. Understory shrubs include ocean spray, snow berry, grouse whortleberry, fool's huckleberry, big huckleberry, and Labrador tea. Beargrass and miscellaneous grasses and forbs are also common.

Past Timber Harvest

Past timber harvest records date to 1960. Twenty eight timber sales sold, with harvest units cut from 1960 through the 2000s. The total area harvested from 1960 to 2016 was 8,567 acres. Refer to the following table for the timber sales by decade and acres harvested.

SALE BY DECADE	SALE ACRES
1960S	**216**
No Name	216
1970s	**2687**
SALE 18	625
SALE 21	451
No Name	1611
1980s	**3343**
BOOT REHAB	10
CAMP CREEK	293
DEER CREEK	693
HEPNER CREEK	22
HEPNER II	198
HONKER	784
LA OVERSTORY	222
MERTON INTERMEDIATE	398
SALE 118	145
SALE 12	3
SALE 120	76
SALE 18	307

SALE 90	170
No Name	22
1990s	**814**
CAMP CREEK SALVAGE	172
HR SALVAGE	201
HUNGRY FACE	294
MILL HELO	107
No Name	39
2000s	**1507**
HONKER II	230
LUCKY MARBLE	268
LUCKY POST	84
MIDDLE FACE	548
MILL HELOCOPTER	377
GRAND TOTAL	**8567**

Fire History

The project area's past fire history is indicative of the changes to the natural wildfire regime, and consequently the landscape, within the past several decades since intensive wildfire suppression began around 1930. The following tables display the area's fire history 1889-1930 and from 1970-present.

Fire History Prior to 1930

FIRE YEAR	FIRE ACRES
1889	14,717
1910	24
1919	8,797
TOTAL	**23,538**

Fire History 1970-Present

FIRE DECADE	NUMBER OF FIRES <50 ACRES in SIZE
1970s	20
1980s	10
1990s	12
2000s	15
TOTAL	**57**

Insect and Disease Conditions

In the absence of fire, forest insects and diseases can accelerate or reset forest succession by affecting tree species, tree size, and stand density. Based on summarized VMAP and recent stand exam information, field exams, mid-1990's permanent growth plot data, aerial detection surveys of the Nez Perce national Forest conducted annually since 2001, and a Forest Health Protection (FHP) group visit in 2013, it appears almost all of the of the Hungry Ridge project area, with the exception of natural openings, may currently be susceptible to insect and disease activity. This level is important because over the last 80-100 years, fire has been replaced by insect and disease as the most prominent agent of change.

Insects: Major insect change agents that currently have scattered outbreaks in the project area include mountain pine beetle (in lodgepole pine), Douglas-fir beetle, and fir engraver beetle (in Douglas-fir and grand fir). Historically, mountain pine beetle played an important successional role in mature lodgepole pine forests that resulted in changes ranging from adjusting species composition to widespread mortality that often built fuels that increased fire susceptibility. According to the FHP 2013 trip report for the project area, one of the two main forest health issues identified was the presence of high tree densities, making the forest stands conducive to bark beetle epidemics. The report states, "If no management is done, these (observed) and similar stands in the project can be expected to have the following outcomes: Areas with current high basal areas of Douglas-fir, grand fir, and lodgepole pine would likely remain vulnerable to attack by bark beetles due to tree age, inter-tree competition, and disease. Under environmental stress, outbreaks could occur that would accelerate mortality from that currently being seen. At all (observed) sites, current forest conditions of over-maturity and overcrowding have set the stage for bark beetle infestation in grand fir, Douglas-fir, and lodgepole pine. At one site, mountain pine beetle (MPB) populations have been steadily increasing over the last several years. This trend could continue, as well as the possibility of MPB increases across the remaining planning area. Pockets of Douglas-fir beetle (DFB) infestations are also shown to be increasing across the planning area as well."

Diseases: Within the project area, some stands have occurrences of dwarf mistletoe in western larch, and Indian paint fungus and fir broom rust in grand fir. However, by far, root diseases are the most prevalent pathogens, due to the increased occurrence of Douglas-fir and grand fir stands with high stem densities. The root disease complex consists of three species, including Armillaria root disease (*Armillaria sp.*), Heterobasidion root disease (*Heterobasidion occidentale*), and laminated root disease (*Phellinus sulphurascens*), all of which occur in Douglas-fir and grand fir (FHP Hungry Ridge site report, 2013). According to the FHP 2013 site report, continued tree infection and mortality from root disease was the second major forest health issue in the Hungry Ridge project area. The report states, "Even without full-scale bark beetle outbreaks, expect that portions of stands and units with high concentrations of Douglas-fir and grand fir will experience continued and increasing mortality from root disease. Root disease will persist in affected stands; the pathogenic fungi that cause root disease survive for decades in stumps and roots of dead and dying trees, and will continue to cause infections and to intensify and cause mortality in susceptible species."

Existing Conditions from the Forest Service Northern Region VMAP Vegetation Data Layer

Vegetation Summary using VMap 2014 dataset (FS-administered lands only)

Cover Type	Seedling/ Sapling (<5")	Pole Tree (5-9.9")	Small Tree (10-14.9")	Medium Tree (15-19.9")	Large Tree (20+")	Total Acres	Percent of Project Area
Herbaceous Vegetation *	--	--	--	--	--	977	2%
Shrub	--	--	--	--	--	446	2%
Ponderosa pine Mix	151	43	410	1093	1167	2863	10%
Douglas-fir Mix	139	56	156	768	436	1556	5%
Grand fir Mix	81	429	1029	13,679	2,588	17,806	61%

Cover Type	Seedling/ Sapling (<5")	Pole Tree (5-9.9")	Small Tree (10-14.9")	Medium Tree (15-19.9")	Large Tree (20+")	Total Acres	Percent of Project Area
Lodgepole pine Mix	173	1537	1801	323	0	3835	13%
Subalpine fir Mix	0	0	600	221	28	849	3%
Engelmann Spruce Mix	3	0	157	276	96	532	2%
Western Red Cedar Mix	0	0	0	275	238	513	2%
Water	--	--	--	--	--	7	<1%
Total	**546**	**2064**	**4,154**	**16,635**	**4,554**	**29383**	**100%**

* Herbaceous cover types include grasslands, meadows, montane parks, herbaceous clearcuts, transitional forest, or barren soil.

Existing Conditions from the South Fork Landscape Assessment (SFLA) Vegetation Response Units (VRUs)

In addition to the Northern Region's VMAP vegetation data layer, the South Fork Landscape Assessment (SFLA) mentioned above was a source used to determine the existing and desired conditions for the project area. **Vegetation Response Units** (VRUs) and **Ecological Reporting Units** (ERUs), as described in the SFLA document, can be helpful in describing the historic and desired condition of an area (based on natural vegetation) and provide an understanding of the desired condition landscape found in this project area.

Vegetation Response Units (VRUs) have similar patterns of successional processes. Features like climate, soil, slope, aspect, and elevation control the bounds of which patterns can change. Processes such as plant community succession, fire, insect and disease activity, drought, and grazing all change the pattern that exists at any one time.

VRUs present in the Hungry Ridge project area include:

VRU 1: Convex slopes, subalpine fir and grand fir habitat types (11,080 acres)
VRU 3: Stream breaklands, Douglas-fir and grand fir habitat types (9,966 acres)
VRU 4: Rolling Hills, grand fir (7,519 acres)
VRU 7: Moist uplands, grand fir habitat types with Pacific Yew (1,407 acres)

The following table displays the Hungry Ridge VRUs grouped by Habitat Type Group:

Habitat Type Group	VRU 1	VRU 3	VRU 4	VRU 7	Grand Total (Acres)	Percent of Project Area	Habitat Type Group Description
0		24			24	0.1	Rock
1		171			171	0.6	Warm, dry PP, DF
2	0	2501	1405		3907	13.0	Moderately warm DF, GF
3	4613	890	2213	780	8496	28.3	Mod. Cool, Mod.dry GF
4	2958	6321	3776	454	13509	45.1	Mod. Warm, moist GF
7	215			6	221	0.7	Cool, moist SAF
8	236	12	1	62	311	1.0	Cool, wet SAF
9	3048			105	3153	10.5	Cool, Mod.dry SAF
18		28			28	0.1	Grasslands
60	11	8	124		143	0.5	Mtn. bottomlands
98		10			10	0.03	Water
Grand Total (Acres)	**11081**	**9966**	**7519**	**1407**	**29973***	**99.93**	
Grand Total (Percent)	**37.0**	**33.2**	**25.1**	**4.7**	**100**		

*Note: This acreage includes private land within the Hungry Ridge project area.

Hungry Ridge Project habitat type groups include:
0 = Rock
1 = Warm and dry ponderosa pine and Douglas-fir
2 = Moderately-warm and dry Douglas-fir and grand fir
3 = Moderately-cool, moderately dry grand fir
4 = Moderately-warm and moist grand fir
7 = Cool and moist subalpine fir
8 = Cool and wet subalpine fir
9 = Cool and moderately dry subalpine fir
18 = Grasslands, Idaho fescue
60 = Mountain bottomlands
98 = Water

The following paragraphs give a brief description of the VRUs (describing historical and existing vegetation) in the project area (SFLA 1998).

VRU 1: Convex slopes, subalpine and grand fir habitat types – This VRU is common at mid and upper elevations, with subalpine and grand fir habitat types being dominant. Lodgepole pine was historically dominant in many settings, with Engelmann spruce, western larch, Douglas-fir, and whitebark pine being less common. Large, infrequent (75 to 100 years) severe fires were typical of most settings. About 60-80 percent of stands originated from stand-replacing fire, and 20-40 percent from mixed-severity fire. Lodgepole pine, western larch, and Douglas-fir sometimes survived the fires to form a scattered overstory. Relative proportion by size class was about 5-10 percent nonforest, 40-60 percent seedling, saplings, and poles, 20-30 percent medium trees, and 5-15 percent large trees.

With advancing forest succession and fire suppression, seral lodgepole pine, western larch, and whitebark pine have declined, and more shade-tolerant grand fir and subalpine fir have increased. Fire occurrence decreased by 90 percent in this VRU. Forest succession, there has produced an 88 percent reduction in seedling/sapling structural stages and a 37 percent increase in medium and large tree stages. With fire suppression has come increased stand densities, as shade-tolerant understories develop, and extensive snag patches are no longer created.

VRU 3: Stream breaklands, Douglas-fir, and grand fir – On south aspects, dry Douglas-fir habitat types are dominant. Open stands of large Douglas-fir and ponderosa pine were historically common, with low and mixed-severity fire at very frequent intervals (5-25 years). 60-90 percent of the stands survived the fires and ponderosa pine old growth occupied about 40-60 percent of these warm dry sites.

On north aspects, grand fir habitat types are dominant. Grand fir and Douglas-fir were common cover types, with ponderosa pine and western larch and sometimes Engelmann spruce or lodgepole pine. Fires were of mixed severity every 25-75 years. Ponderosa pine, Douglas-fir, western larch, and grand fir formed the old overstory. For the whole VRU, relative proportion by size class was about 5-20 percent nonstocked, 15-50 percent seedlings, saplings, and poles, 20-40 percent medium trees, and 20-40 percent large trees.

With advancing forest succession and fire suppression, ponderosa pine/Douglas-fir forests have declined by 13 percent, with a 33 percent decline in seedlings/sapling tree stages, 83 percent decline in pole stages, 36 percent decrease in medium tree stages, and a 6 percent increase in large tree stages. Fire incidence has decreased by 70 percent. As a result of fire suppression, extensive snag patches are no longer being created.

VRU 4: Rolling hills, grand fir - This VRU is common at low and mid elevations, with grand fir habitat types being dominant. Grand fir, Douglas-fir, ponderosa pine, and western larch were historically dominant, with Engelmann spruce and lodgepole pine being less common. Fires occurred at moderate intervals. About 50-60 percent of stands originated from stand-replacing fire and 40-50 percent from mixed and low-severity fire. Ponderosa pine, western larch, Douglas-fir, and grand fir formed a scattered overstory of large, old trees. Relative size class proportion was about 5-10 percent nonforest, 15-80 percent seedlings, saplings, and poles, 20-30 percent medium trees, and 10-50 percent large trees.

With advancing forest succession and fire suppression, ponderosa pine/Douglas-fir forests have declined by 32 percent. Lodgepole pine has decreased by 31 percent, and grand fir/Douglas-fir forest has increased by 43 percent. There has been a 33 percent decline in seedling/sapling structural stages, and a 12 percent decrease in large tree stages. Fire occurrence has declined by 99 percent. Again, extensive snag patches are not being created, due to fire suppression.

VRU 7: Moist uplands, grand fir, and Pacific yew – This VRU is common at mid elevations here, but is quite rare elsewhere in northern Idaho. Mesic grand fir habitat types are dominant, with Pacific yew phases common. Grand fir, Douglas-fir, and Pacific yew were historically the dominant species, with western larch, Engelmann spruce, and lodgepole pine being less common. Fires of mixed severity occurred at infrequent intervals (75-150 years). About 60 percent of the stands experienced mixed-severity fire, and 40 percent originated from stand-replacing fire. Old overstory trees were common and consisted of grand fir, western larch, Douglas-fir, Engelmann spruce, or lodgepole pine. Pacific yew and mesic old growth were important in this landscape. Relative proportion by size class was about 1-10 percent nonforest, 15-45 percent seedlings, saplings, and poles, 25-35 percent medium trees, and 35-45 percent large trees.

With harvest and planting, Douglas-fir/ponderosa pine forest has increased 107 percent. Fire suppression and forest succession have produced a 57 percent decline in seedling/sapling stages, a 45 percent decline in pole stages, and a 22 percent decline in large tree stages. Fire occurrence has decreased by about 99 percent. Extensive snag patches are not being created, due to fire suppression.

Existing Condition by Forest Vegetative Indicators:

The following discussion summarizes the changes in the existing condition from the anticipated conditions, if natural disturbance processes had been allowed to continue without interference. Indicators of this change include forest cover type composition (species) and forest structure (tree size classes).

Forest Cover Type (Species)

INTRODUCTION

The exclusion of wildfire, a naturally-occurring ecological process, from the area/landscape has resulted in a vegetative condition that did not historically exist in the area. This resulting condition, with its associated fuels buildup, poses an increased risk for catastrophic wildfire, which would subsequently affect specific resources including water quality, wildlife populations and habitat, and old growth. Forest composition can influence how a fire would behave and affect the vegetation in a stand. Certain tree species have physical characteristics that allow them to be more resistant to fire. Of the main species found in the project area, western larch, ponderosa pine, and Douglas-fir are the most fire-resistant and least shade-tolerant, while grand fir, Engelmann spruce, and subalpine fir are the least fire-resistant and most shade-tolerant (Smith and Fischer 1997). Lodgepole pine is shade-intolerant and has little resistance to fire. Stands composed primarily of the more fire-resistant species have a better chance of surviving a fire.

EXISTING CONDITION

The forest species composition in the project area has changed over the last century, due primarily to fire exclusion. The natural, very-frequent and frequent disturbance regimes have been altered in VRUs 3 and 4, having a pronounced effect on the forest composition of the area. Specifically, shade-intolerant species, mainly ponderosa pine, have decreased, while shade-tolerant species are increasing in the area (USDA Forest Service 1998). Fewer acres of pure ponderosa pine stands currently exist than would have been anticipated under natural conditions. Much of the increase in canopy layers is due to growth of shade-tolerant species underneath and into the lower part of the existing forest canopy. The shade-tolerant species are not as well-adapted to the drier habitats, are more susceptible to drought and fire, and are less resistant to insects and diseases than the ponderosa pine-dominated forests that historically occurred here (Arno 1988, pp. 134-135). The change in forest composition is also important to wildlife species that are adapted to live in the historic forest conditions.

Past fire suppression and dispersed clearcut harvests have contributed to forest conditions and landscape patterns that differ from those that would have occurred in the absence of such actions. Past regeneration harvest units typically contain few large snags and lower amounts of coarse woody debris than untreated areas. Early- and late-successional forest stages have been reduced in extent and diversity of patch size. Movement corridors and diversity of wildlife cover are less available. Ladder fuels that can transition to crown fires are more abundant in most unharvested stands.

The southern end of the project area contains areas of dying and dead lodgepole pine that would have been naturally-regenerated by wildfire. So far, the impact by mountain pine beetles is low, with past mortality and currently-infested live trees at endemic levels. Some lodgepole pine is being replaced by stands of shade-tolerant mixed conifers, which are more susceptible to root disease. Mixed-conifer forest that would have been visited by mixed-severity fire, with resulting maintenance or regeneration of Douglas-fir, western larch, and ponderosa pine, is more uniformly multistoried and more densely-stocked than natural. These stands are more subject to drought stress and pathogens.

There is a need to restore more-frequent disturbance dynamics in this landscape to better reflect the historic size of fire disturbance, provide large patches of snags, and sustain seral species in the landscape. The current advancement of root disease is setting the stage for fuel buildup with resulting wildfires which may be difficult to control. The new treatment units, along with those from the past, will help form areas from which wildfire control lines may be constructed.

Actions planned to transition toward more natural disturbance types, scale, and pattern in the landscape include the following harvest prescriptions: clearcut with reserve trees, seedtree regeneration harvest, shelterwood with reserves, and commercial thinning to favor larger, more-fire-resistant trees. A combination of piling and burning and broadcast burning would be used to reduce fuels and rejuvenate shrub species. Scale of harvest areas would vary more widely than in recent harvest history. These treatments are designed to produce a variable-density mosaic across the landscape.

Actions to recover landscape pattern include clustering of harvest adjacent to existing harvested areas to create some larger early-seral openings, while increasing retention of green leave trees, snags, and down wood. Actions to recover or maintain “at-risk” species in the landscape include thinning/shelterwood harvest to maintain western larch, ponderosa pine, and Douglas-fir, and regeneration harvests followed by planting of some areas with seral species to increase the abundance of these species on the landscape.

The action alternatives will use timber harvest, planting, and precommercial thinning to begin changes toward achieving the desired landscape pattern, species distribution, and age classes.

Forest Structure (Tree Size Classes)

INTRODUCTION

The existing condition for forest structure in the project area has changed over the last century due to fire exclusion with resulting forest succession, and due to timber harvest. In all project area VRUs, stand density, both in canopy layers and basal area stocking, has increased. Single-canopied stands occupy fewer acres than historically. The loss of open, ponderosa pine-dominated stands is mostly attributable to fire exclusion. This exclusion has decreased the frequency of low-severity fires that historically maintained the area’s natural forest structure, and has allowed shade-tolerant species to encroach on these stands, creating dense understories and midstories of live and ladder fuels. As the shade-tolerant species have increased, some of the stands that historically contained a single canopy layer have developed into dense stands with two or more canopy layers. Timber stand density (canopy layers, crown closure, and basal area per acre) is higher than would have been anticipated under natural processes in both mature stands and regenerating stands. Forest succession and fire suppression have resulted in declines in seedling and sapling structural stages, declines in pole stages, and decreases in medium tree stages.

Existing Condition

Average tree size varies depending on year of origin, tree species, and growing conditions. Approximately 1.9 percent of the analysis area consists of regenerating harvest units with tree diameters less than five inches, and 93.1 percent of the area supports trees with five inches diameter at breast height (DBH) or greater. The past harvest analysis indicates that 29 percent of the project area was harvested within the last 56 years. (Refer to the VMAP and Past Harvest tables above). The current structural analysis (exams and remote sensing) reveals that all of the past regeneration harvests have been successfully reforested by planting. Only the more recent harvests (1990+) are dominated by trees in the sapling stage, which is 5 inches DBH and smaller. The other harvested acres represent the small- to medium-tree category (5-14.9 inches DBH), comprising 21 percent of the project area. Mature ponderosa pine/Douglas-fir stands comprise 5.4 percent of the project area, while mature stands of lodgepole pine comprise less than one percent. Mature conifer, containing a mix of species which can obtain larger diameters than most lodgepole pine, comprises the large tree component in the remaining project area.

Desired Conditions

Desired Vegetative Forest Cover Type (species):

In addition to the VRU existing conditions described in the 1998 SFLA document, several management themes were developed for the South Fork area, which includes the Hungry Ridge project area. These management themes are “designed to either conserve or restore landscape elements, functions, and/or processes” (SFLA, 1998). Functional management themes were developed for the resource areas of vegetation, wildlife, aquatics, and recreation. The management themes for the resource areas are described in the SFLA and tied to the various VRUs.

For Hungry Ridge, VRU 1 was assigned a functional management theme of “Restoring the Vegetation Pattern” and “Restoring Whitebark Pine”. VRUs 3 and 4 were assigned a theme of “Restoring Ponderosa Pine”. VRU 7 was assigned a theme of “Conserving Existing Vegetation Conditions” (SFLA, 1998). These management themes for the different VRUs, with desired tree species and stand structural conditions, are described briefly as follows:

VRU 1: *Restoring the Vegetation Pattern and Restoring Whitebark Pine* – Restore a low frequency, mixed, and lethal severity terrestrial disturbance regime, at moderate to large scales to recover landscape pattern and seral species in cool and cold climates: lodgepole pine, Douglas-fir, and western larch, with Engelmann spruce, subalpine fir, and whitebark pine. Maintain seral whitebark pine in appropriate stands through reduction of competition from subalpine fir, Engelmann spruce, and lodgepole pine. Favor treatments that restore size and heterogeneity of patch size (100-1000s of acres), provide extensive medium tree and pole snag patches, provide open burned areas for caching of whitebark pine seed, and promote establishment of lodgepole pine and western larch.

VRUs 3 and 4: *Restoring Ponderosa pine* – Restore a high and moderate frequency, low- and mixed-severity terrestrial disturbance regime, to recover open and two-story stands dominated by medium and large ponderosa pine, with some Douglas-fir and western larch. Disturbance activities in subwatersheds can occur as often as every 5 to 30 years. Prescribed fire is highly-suited to this management theme. On south aspects, ridges, and other dry sites, harvest or fire treatments favor recovery and maintenance of open stands of medium to large ponderosa pine, with less Douglas-fir, and minor western larch and grand fir. On north aspects, dominantly mid-slope positions, harvest or fire treatments favor about 50 percent stand replacement and 50 percent development of two-story stands.

VRU 7: *Conserving Existing Vegetative Conditions* – Maintain a low-frequency, mixed-severity terrestrial moist climates: lodgepole pine, Douglas-fir, and western larch on ridges, with grand fir, Engelmann spruce, subalpine fir, and Pacific yew on lower slopes or moist areas. Favor treatments that maintain seral species on uplands and a complex age class structure.

Desired Vegetative Stocking Levels by Tree Size Class:

The following information presents desired tree stocking levels by VRU, as derived from the functional management themes described above.

VRU 1:
5 - 10% nonforest or nonstocked, 20-30% seedling/sapling, 20-30% pole, 20-30% small and medium tree, 5-15% large tree. Old growth comprises 10 -15% of this VRU.

VRUs 3 & 4:
5 – 20% nonforest or nonstocked, 5 – 30% seedling/sapling, 10-20% pole, 22-33% small tree, 20-40% medium tree, and 20-40% large tree. Ponderosa pine old growth occupies 40-60% of warm dry sites.

VRU 7:
1-10% nonforest or nonstocked, 5-20% seedling/sapling,10-25% pole, 25-35% medium tree, 35-45% large tree

Existing and Desired Stocking Level Conditions by VRU

Existing Condition by VRU 1 - 11,080 ac.	**Desired Condition by VRU 1**
VRU 1 Stocking	VRU 1 Stocking
3% non-stocked (371 ac.)	5-10% non-forest or non-stocked (554 to 1108 ac.)
0.1% sapling (17 ac.)	20-30% seedling/sapling (2216 to 3324 ac.)
9% pole (973 ac.)	20-30% pole (2216 to 3324 ac.)
44% small tree (4900 ac.)	20-30% small tree (2216 to 3324 ac.)
19% medium tree (2120 ac.)	20-30% medium tree (2216 to 3324 ac.)
24% large tree (2699 ac.)	5-15% large tree (554 to 1662 ac.)

Existing Condition by VRU 3 - 9,966 ac.	**Desired Condition by VRU 3**
VRU 3 Stocking	VRU 3 Stocking
10% non-stocked (994 ac.)	5-20% non-forest or non-stocked (554 to 1108 ac.)
0.1% sapling (13 ac.)	5-30% seedling/sapling (2216 to 3324 ac.)
0.7% pole (69 ac.)	10-20% pole (2216 to 3324 ac.)
5% small tree (459 ac.)	22-33% small tree (2216 to 3324 ac.)
28% medium tree (2813 ac.)	20-40% medium tree (2216 to 3324 ac.)
56% large tree (5618 ac.)	20-40% large tree (554 to 1662 ac.)

Existing Condition by VRU 4 - 7,519 ac.	Desired Condition by VRU 4
VRU 4 Stocking	VRU 4 Stocking
9% non-stocked (693 ac.)	5-20% non-forest or non-stocked (554 to 1108 ac.)
0% sapling (0 ac.)	5-30% seedling/sapling (2216 to 3324 ac.)
2% pole (140 ac.)	10-20% pole (2216 to 3324 ac.)
26% small tree (1977ac.)	22-33% small tree (2216-3324 ac.)
27% medium tree (2009ac.)	20-40% medium tree (2216 to 3324 ac.)
36% large tree (2699 ac.)	20-40% large tree (554 to 1662 ac.)

Existing Condition by VRU 7 - 1,407 ac.	Desired Condition by VRU 7
VRU 7 Stocking	VRU 7 Stocking
1% non-stocked (14ac.)	1-10% non-forest or non-stocked (14-140 ac.)
0% sapling (0 ac.)	5-20% seedling/sapling (70-281 ac.)
1% pole (14 ac.)	10-25% pole (140 to 352 ac.)
61% medium tree (858 ac.)	25-35% medium tree (352to 4924 ac.)
1.5% large tree (27 ac.)	35-45% large tree (492 to 634 ac.)

Direct and Indirect Effects:

Environmental consequences are the effects of implementing an alternative on the physical, biological, social, and economic environment.

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially-removed from the activity, but would be significant in the foreseeable future.

Action alternatives would have some direct effects on forest cover types and stand structure. Age-class distribution, stand density, and species composition would be modified on treated acres. All three action alternatives would reduce the potential for severe fire through fuel removal, and would modify the susceptibility of forested stands to insect or disease outbreaks. The difference between the action alternatives is the number of acres.

Forest Cover Type (Species Composition)

Alternative 1 (No Action)

No direct effects to cover type are associated with this alternative. Under the no-action alternative, the current species composition in the project area would not immediately change. Over time, shade-intolerant species would be replaced with shade-tolerant species through forest succession, so fewer seral western larch and ponderosa pine would exist in the area (Young 1982, pp. 136-140). This continued shift toward more shade-tolerant species would transition the area farther away from its natural forest composition under historic disturbance regimes. This shift would be most easily and quickly seen where existing ponderosa pine stands would become mixed with, and eventually dominated by, Douglas-fir and grand fir. These forests would be less resistant to fire due to their increased stocking and ladder fuels, and would change to less-fire-tolerant species (Arno 1988, pp. 134-135).

Alternatives 2, 3, and 4 (Action Alternatives)

The table below displays how the different alternatives would treat forest cover types in the project area.

Regeneration Harvest-Treated Acres/Percentages by Cover Type and Alternative

Cover Type	Percent of NFS Lands in the Project Area					
	Project Area Desired Percentage	Alt. 1 (No Action) – Existing Condition %	Alt. 2 – Regeneration Treatment Acres/%	Alt. 3 – Regeneration Treatment Acres/%	Alt. 4 – Regeneration Treatment Acres/%
Mixed conifer - shade intolerant (PP/WL/DF)	14-30	15	106 – 0.4%	105 – 0.4%	103 – 0.4%
Mixed conifer - shade tolerant (GF/SAF/ES)	23-45	66	4590 – 15.6%	4555 – 15.5%	4348 – 14.8%
Lodgepole pine/western larch mix	15-29	13	1426 – 4.9%	1426 – 4.9%	1396 – 4.8%
Western Red Cedar Mix	0-5	2	22 – 0.07%	22 – 0.07%	22 – 0.07%
Transitional Forest, Shrubs, Herbs, Grassland	0-5	4	88 – 0.3%	78 – 0.3%	77 – 0.3%
Total			6232 – 21.27%	6186 – 21.17%	5946 – 20.37%

Note: Based on 29,364 acres, ie. national forest minus private land

Activities proposed in Alternatives 2, 3, and 4 would cause the vegetative condition to more closely resemble conditions that would have developed had the natural disturbance regime in the area (mainly wildfire) continued to occur. The commercial thinning, precommercial thinning, and regeneration harvests would reduce the level of hazardous fuels in the project area, although there may be a short-term increase in risk of wildfire before the long-term benefits are realized. These treatments would create areas at decreased risk of high-severity and crown fires, allowing wildfire to play its natural role in the treated areas in all VRUs (Omi and Martinson 2002). The forest communities within the project area would benefit from these changes, because they have adapted over time to frequent-fire-return intervals.

The proposed treatments are designed to reduce the amount of shade-tolerant species, mainly grand fir and Douglas-fir (USDA Forest Service 2002b). The commercial thinning treatments are designed to leave the more fire-resistant, larger overstory ponderosa pine, western larch, and Douglas-fir trees, and remove the understory and small overstory trees, which are mainly grand fir and Douglas-fir. The regeneration harvests would promote the growth of more seral lodgepole pine, ponderosa pine, and western larch, and prevent the stands from reverting to grand fir. Natural regeneration of lodgepole pine is expected in some regeneration areas, and supplemental planting of seral western larch and ponderosa pine would also help prevent the stands from reverting to grand fir. In mixed-conifer stands, regeneration harvests would be followed by planting of seral species (ponderosa pine and western larch), which are less susceptible to root disease and more fire-resistant.

Precommercial thinning would favor the retention of mostly seral species by removing the more shade-tolerant, climax species which naturally regenerated among the planted seral species. Precommercial thinning to adjust species composition and maintain space around the early-seral western larch and pine saplings is highly recommended to maintain growth and vigor of these species (Hagle 2010, p. 9).

All action alternatives make progress toward the desired condition for forest cover type within treated stands; however, none of the alternatives completely achieves the desired condition for the whole analysis area. Alternative 2 makes the most progress toward the desired condition for forest cover type, because more acres would be treated. Alternative 2 proposes 8750 acres of mechanical treatment (thinning, regeneration harvest, and precommercial thinning) in all VRUs, and Alternative 3 proposes 8569 acres. Alternative 4 proposes 7988 acres.

In areas without vegetative treatment, the effects on cover type would be similar to those described under Alternative 1 (No Action). Refer to the table below for a display of the resulting cover type percentages for the different treatment alternatives.

Resulting Cover Type Percentages by Alternative

Cover Type	Project Area Desired Percentage	Alt. 1 (No Action) – Existing Condition Percent	Alt. 2 – Project Area %	Alt. 3 – Project Area %	Alt. 4 – Project Area %
Mixed conifer - shade intolerant (PP/WL/DF)	14-30	15	30.6	30.5	29.8
Mixed conifer - shade tolerant (GF/SAF/ES)	23-45	66	50.4	50.5	51.2
Lodgepole pine/western larch mix	15-29	13	13	13	13
Western Red Cedar Mix	0-5	2	2	2	2
Transitional Forest, Shrubs, Herbs, Grassland	0-5	4	4	4	4
Total		100	100	100	100

Note: Based on 29,364 acres, ie. national forest minus private land

Forest Structure (Tree Size Classes)

Alternative 1 (No Action)

Alternative 1 would not immediately change the current forest structure in all VRUs of the project area. Forest succession would continue toward denser stands with multiple canopies, by ingrowth of shade-tolerant species into the understories and midstories of the existing stands. Over time, forest succession would increase the tree stocking as new trees become established, and as existing trees increase in diameter (Husch et al. 1982). Trees in areas of windthrow and insect or disease centers would become less dense, and would be replaced with smaller tree size-classes. These changes would probably occur over relatively small areas, and would not significantly change the course of forest succession. Barring fire or insect and disease epidemics, stand densities would decrease as stands mature and inter-tree competition results in the demise of some stems.

Under the no-action alternative (Alternative 1), root disease would continue to kill susceptible trees before they reach maturity. In these areas, large tree size-classes would decrease, and mortality would add to the existing fuel load. With fire exclusion, shade-tolerant tree species would grow into the understory, increasing the number of canopy layers and providing more available fuel and ladder fuels. Fire exclusion would also allow timber stands to increase in density.

Root disease would continue to advance through root-to-root contact as the forest becomes denser, and as the numbers of the more-susceptible Douglas-fir and grand fir increase (Lockman 1997). Additionally, as the stand densities increase over time, the stands would become more susceptible to bark beetle attack, mostly by Douglas-fir beetle and mountain pine beetle. Insects would continue attacking less-vigorous individual trees and small pockets of trees. Other influences such as extended drought, windthrow, or a nearby moderate- or high-severity fire could cause an increase in insect activity by weakening more trees and creating conditions favorable for an insect population buildup (USDA Forest Service 1989; USDA Forest Service 1996).

As Douglas-fir and grand fir continue encroaching onto less-favorable sites, the trees would have a higher probability of becoming stressed, which would increase their susceptibility to root disease and bark beetles. As the extent of root disease and bark beetle attacks increases, gaps would be created in the tree canopy, increasing the windthrow possibility, which would create more favorable conditions for bark beetles (USDA Forest Service Region 1 et al. 1994). These small gap openings created in the canopy would also encourage regeneration of more shade-tolerant species on marginal sites, continuing the trend toward denser stands of shade-tolerant species than would have occurred with the natural disturbance regime.

With this alternative, the natural fire disturbance pattern would continue to be disrupted by wildfire exclusion. In all VRUs, at some point an unnaturally-severe, stand-replacing event may occur.

Alternatives 2, 3, and 4 (Action Alternatives)

Direct effects to tree size classes would include a large increase in seedling/sapling size classes in regeneration harvest areas in all action alternatives, and a large reduction in small through large size classes. The small through large size classes would also be reduced by intermediate thinning treatments, but not to the same extent as in the regeneration harvest units. The table below displays direct effects of implementation of the action alternatives to tree size classes in the project area. Indirect effects associated with mechanical treatments would be increased tree growth and vigor, as well as resistance to damage from fire to remaining trees. All size classes would benefit through reduced competition for sunlight, water, and nutrients.

The prescribed harvest treatments would reduce stand densities, thus increasing remaining individual tree vigor and decreasing insect and disease susceptibility. Commercial thinning and regeneration harvesting would reduce basal area and the number of canopy stories in treated stands. The harvests would reduce the incidence of shade-tolerant species on dry ponderosa pine and Douglas-fir sites, thereby also decreasing the risk of insect or disease outbreak (Arno 1988, p. 135).

Precommercial thinning would reduce the basal area stocking, leaving the larger, healthier trees. Precommercial thinning to adjust species composition and maintain space around the early seral western larch and pine saplings is highly recommended to maintain growth and vigor of these species (Hagle 2010, p. 9).

Increased vigor and resistance to damage from fire, insects, and disease would be expected for all tree species in treated areas. Reduced densities would create openings and favorable conditions for establishment of fire-resistant early-seral species such as ponderosa pine and western larch. In areas usually dominated by lodgepole pine, this species would be expected to reestablish rapidly from local seed sources. In areas where ponderosa pine and western larch have been reduced, these species would be planted to assure reestablishment. Increased potential for wind damage may occur in some areas; however, protection of remaining trees would be minimized through project design features, such as leaving tree clumps instead of single trees.

In areas without vegetative treatment, the effects on forest structure would be similar to those described under Alternative 1.

Although the action alternatives do not transition all of the project area to within its historic range of variability (HRV) for forest structure, progress is made toward this goal in treated areas through timber harvest, planting, and precommercial thinning.

The table below displays how the action alternatives would affect forest structure in the project area. These numbers have been calculated for regeneration harvest treatments only. The regenerated acres would change from having predominantly pole-sized, small, medium, and large-sized trees to early successional habitat, with predominantly seedlings and saplings in the 0-5" diameter range. Thus, the early successional size class would see a gain in acreage for each action alternative, and the other size classes would realize a loss.

Regeneration Harvest Acres by Alternative by Size Class

Size Class (inches)	**Regeneration Harvest of NFS Land by Alternative**				
		Alternative 1 (No Action)	**Alternative 2**	**Alternative 3**	**Alternative 4**
Nonforest/Transitional Forest		0	91	91	90
Seedlings/saplings - 0-5"		0	22	22	22
Poles - 5-9.9"		0	779	779	758
Small trees - 10-14.9"		0	1148	1147	1109
Medium trees -15-20"		0	3961	3933	3776
Large trees - 20+"		0	322	317	294
TOTAL:		0	6323	6289	6049

*(USDA Forest Service 1998) Based on project area acres minus private land

Resulting Size Classes by Alternative

Size Class (inches)	Percentage of NFS Land in the Project Area				
	Desired Percentage *	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4
Nonforest/Transitional Forest	5-10	4.9	Harvest – 0.3 Result – 4.6	Harvest – 0.3 Result – 4.6	Harvest – 0.3 Result – 4.6
Seedlings/saplings - 0-5”	5-30	1.9	Harvest – 0.07 Result – 23.3	Harvest – 0.07 Result – 23.2	Harvest – 0.07 Result – 22.4
Poles - 5-9.9”	10-20	7.0	Harvest – 2.7 Result – 4.3	Harvest – 2.7 Result – 4.3	Harvest – 2.6 Result – 4.4
Small trees - 10-14.9”	20-40	14.1	Harvest – 3.9 Result – 10.2	Harvest – 3.9 Result – 10.2	Harvest – 3.8 Result – 10.3
Medium trees -15-20”	20-40	56.6	Harvest – 13.5 Result – 43.1	Harvest – 13.4 Result – 43.2	Harvest – 12.9 Result – 43.7
Large trees - 20+”	5-45	15.5	Harvest – 1.1 Result – 14.4	Harvest – 1.1 Result – 14.4	Harvest – 1.0 Result – 14.5

*(USDA Forest Service 1998) Based on project area acres minus private land

Cumulative Effects:

Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably-foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually-minor, but collectively-significant, actions taking place over a period of time. The cumulative effects analysis for the alternatives included consideration of the effects of past, present, and reasonably foreseeable actions.

Past analysis area activities include timber harvest, wildfires, and fire suppression. Past actions are described previously in the Existing Condition section for this resource. Regeneration harvests maintained the natural species composition through planting of early-seral species. The resulting tree size-classes are part of the existing condition. Historically, wildfire maintained open-grown ponderosa stands within the area. Wildfire exclusion has allowed encroachment of shade-tolerant species into the understory, increasing the risk of stand-replacing fires by creation of ladder fuels, and increased accumulations of ground fuel. The effects of the past actions are reflected in the existing condition for vegetation.

No present or on-going vegetation treatment actions that would affect the forest vegetation in the analysis area were identified. Maintenance of the existing recreation and heritage resource sites (primarily trails) within the analysis area is not expected to significantly affect the vegetation. Grazing is also not expected to cumulatively affect tree species and stand structure in the analysis area.

The effects of the proposed actions are described in each indicator's effects analysis section. The environmental effects for each indicator discussed earlier in this section, when combined, show the cumulative effects of treatments identified in the alternatives.

Reasonably- foreseeable activities that would affect the forest vegetation include up to 2321 acres of potential precommercial thinning in plantations resulting from past timber sales conducted during the 1990s and 2000s. These plantations are expected to be thinned within the next decade, through planning and analysis in separate documents.

Alternative 1 (No Action)

Alternative 1 would have no immediate effect on the vegetative condition in the analysis area. In the short-term, forest structure and composition would remain the same as in the current condition. The only active vegetative management that would occur under this alternative is the continuation of up to 2321 acres of potential precommercial thinning. Over time, the area would continue to change as fire exclusion keeps the major disturbance agent for the area (wildfire) from playing its natural role.

In all VRUs, the vegetative composition would continue to change to more shade-tolerant species, and few or no early-seral, shade-intolerant species would regenerate in the area. As the shade-tolerant species grow into and eventually dominate the stands, fewer acres of ponderosa pine forest and lodgepole pine forest would exist. The continued encroachment by shade-tolerant species would increase stand densities and increase the risk of stand-replacing wildfire. As the trees continue to grow, fewer acres would contain smaller size-classes of trees, and more area would contain larger size-classes of trees. With the larger trees and dense, less-vigorous stands, root rot and bark beetle attack susceptibility would increase (USDA Forest Service Region 1 et al. 1994). Root disease severity would continue to increase, causing significant impacts to future generations of trees. Down fuels would be increased, and openings created. The old-growth forests in the area would experience the same changes described above, placing the old growth at risk from stand-replacing wildfire, and changing the characteristics of the old growth from what was historically in the area.

Alternatives 2, 3, and 4 – Action Alternatives

Because more acres of land are treated, Alternative 2 makes the most progress toward the historic range for the indicators of forest cover type and forest structure within treated stands. Alternatives 3 and 4 make less progress toward historic range of variability (HRV), because fewer acres of land are treated. The timber harvest treatments address the departure of these indicators from their historic range (refer to effects sections for each indicator). Treatments would reduce timber stand density and reduce the encroachment of shade-tolerant tree species, therefore decreasing the risk of insect or disease outbreak and reducing the fire risk in the project area. The proposed treatments would help restore succession of early-seral species in the area, and are designed to start restoring the open-grown forest structure that once typified fire-climax ponderosa pine.

Effectiveness of Mitigation

The following design and mitigation measures related to the vegetation resource would be implemented for Alternatives 2, 3, and 4: #s 1 and 2 pertaining to Visual Resources. These mitigation measures would include cutting stumps to a height of 8" or less in harvest units within 300 feet of Road #444A. Also, logging slash within 300” of this road would be treated if it were in excess of two feet in height. The measures are specified in full in Chapter 2, Design and Mitigation Measures.

These measures have been implemented in several projects across the South Zone on the Nez Perce/Clearwater National Forest, and monitoring over the past several years has demonstrated their effectiveness in mitigating the visual effects of harvesting within 300’ of a main viewing platform such as a road, recreation site, or administrative site.

Consistency with the Forest Plan and Environmental Laws

Nez Perce National Forest Land and Resource Management Plan Direction

The Nez Perce National Forest Plan establishes goals and objectives for the management of the Forest in Chapter II, pages 1-8 (USDA Forest Service 1987). The purpose of specific Forest Plan goals that apply to vegetation management in the Hungry Ridge project area is to:

- Provide a sustained yield of resource outputs that will help support the economic structure of local communities and provide for regional and national needs (p. II-1).
- Provide and maintain a diversity and quality of habitat to support viable populations of native and desirable non-native wildlife species (p. II-1).
- Protect resource values through the practice of integrated pest management (p. II-2).

The Forest Plan identified management-area designations to distinguish differing management emphases between geographic areas, and contains general guidelines, goals, and standards for management of forest vegetation within these areas. Chapter III describes specific goals and standards for each resource by individual Management Area (MA). Goals and standards for the Management Areas occurring in the Hungry Ridge analysis area are summarized below.

Management Area 1 (689 acres): Provide the minimum management necessary to provide for resource protection. Harvesting may occur to remove volume lost through catastrophic mortality, or to control insect and disease epidemics that threaten adjacent timbered lands. Firewood removal may occur where access exists.

Management Area 9 (80 acres): Wilderness – Manage the wilderness values as specified by the Wilderness Preservation Act of 1964.

Management Area 10 (823 acres): Manage to protect or enhance riparian-dependent resources. The desired condition for forest vegetation is a mosaic of multi-layered plants and trees. The structure, composition, and diversity of vegetation will protect stream banks and channels, provide acceptable water temperatures, provide cover for fish, and maintain corridors for wildlife travel between old-growth stands.

Management Area 12 (21,676 acres): Manage for timber production and other multiple uses on a sustained-yield basis. Future forest vegetation will have an equal distribution of age classes, based on primarily even-aged silvicultural systems. Artificial reforestation will be designed to meet stocking levels in five years; naturally-regenerated stands will be managed to meet desired stocking levels in 20 years.

Management Area 13, 14, 17, 18 (331 acres): Manage for multiple uses on a sustained-yield basis, while meeting visual quality objectives of retention or partial retention. These management areas consist primarily of forested lands that have a high to medium degree of visual sensitivity. Reforest to desired stocking levels within five years, except where long-term vistas are to be maintained.

Management Area 16 (3165 acres): Manage to increase usable forage for elk and deer on potential winter range. This MA contains land suitable and unsuitable for timber production. Design harvests to achieve desired combination of cover and forage. Openings will be designed to provide browse production for 10 to 20 years.

Management Area 20 (2478 acres): Manage for old-growth habitat for dependent species. The old-growth forest in this MA consists of replacement or existing old growth. Replacement old growth will generally be immature stands that are naturally changing to desirable characteristics of old, decadent forest. Existing old-growth stands currently contain large decadent trees, snags, and down wood, meeting the Nez Perce National Forest Plan criteria for old growth.

Through vegetative treatments (timber harvest, planting, and precommercial thinning), this project provides resource outputs, promotes wildlife habitat, and protects resource values in compliance with Forest Plan goals and standards listed above.

Standard Number	Subject Summary	Compliance Achieved By
MA 1	Minimum management	No harvest
MA9	Wilderness management	No harvest
MA 10	Riparian Area management	No harvest
MA 12	Timber management	Follow standards listed below
MA 16	Elk Winter Range management	No harvest
MA 17	Visual Quality management	Follow recommendations of Forest Scenery Management Specialist
MA 20	Old Growth management	Forest Plan Amendment

Approximately 74% of the acres proposed for vegetation management activities for this project are located within **Nez Perce National Forest Plan** management area (MA) 12, emphasizing timber management. Lands within MA 12 are intended to provide optimum, sustained production of wood products, and to produce timber in a cost-effective way, while providing adequate protection of soil and water quality. The standards given in the Forest Plan for MA 12 include the following:

- Lands are classified as "suitable" for timber management; schedule timber harvest. Use primarily even-aged silvicultural systems. Final determination of the silvicultural system to be used will be based on an on-the-ground, site-specific analysis.
- Reforest to desired stocking levels within 5 years following final harvest.
- Replant or thin to reach desired stocking levels by age 20.

Alternative 1 (No Action)
If Alternative 1 is selected, goals and standards of Management Area 12 would not be met. Proposed

harvest treatments are necessary in order for timber production to be maximized. Stocking control would not be maintained in units proposed for thinning, if no action is taken.

Alternatives 2, 3, and 4

Action Alternatives 2, 3, and 4 meet the intent and standards given in the Forest Plan for Management Area 12. Timber production would be optimized by harvesting using silvicultural techniques appropriate for each site. Silviculturally, Alternative 2 is preferable to Alternatives 3 and 4 in meeting the standards and goals of this management area, due to the increased area of treatment for optimization of timber production, for maintaining stocking control, and for reducing volume losses due to insect and disease attacks. Stands dominated by ponderosa pine and western larch can be expected to yield the highest production and suffer the fewest disease or insect problems in the future. For descriptions detailing accomplishment of these goals, see the environmental consequences sections of the vegetation indicators.

Nez Perce National Forest Plan Amendment 20 (PACFISH)

Amendment 20 to the Forest Plan (USDA Forest Service 1995) incorporates PACFISH standards and guidelines. Timber Management guidelines state: "prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas (RHCAs), except…where catastrophic events such as fire, …wind, or insect damage result in degraded riparian conditions,…and where adverse effects on listed anadromous fish can be avoided." "Apply silvicultural practices for RHCAs to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives. Apply silvicultural practices in a manner that does not retard attainment of Riparian Management Objectives, and that avoids adverse effects on listed anadromous fish."

For Alternatives 2, 3, and 4, all of these guidelines would be followed in order to comply with Forest Plan Amendment 20.

Other Laws and Regulations

National Forest Management Act of 1976

The National Forest Management Act of 1976 (NFMA) states that "timber would be harvested from National Forest Land only where there is assurance that such lands can be adequately restocked within five years after harvest" (16 U.S.C. 1604). Additional clarification on this subject is found in the Code of Federal Regulations, which specifies that, "When trees are cut to achieve timber production objectives, the cuttings shall be made in a way as to assure that the technology and knowledge exists to adequately restock the lands within five years after final harvest. Research and experience shall be the basis for determining whether the harvest and regeneration practices planned can be expected to result in adequate restocking." The statement, "Five years after final harvest…" means five years after clearcutting, five years after final overstory removal in shelterwood cutting, five years after seed-tree-removal cut in seed-tree cutting, or five years after selection cutting" (Title 36 CFR 219.27 (c) (3)).

Past reforestation practices in the Hungry Ridge project area have proven to be successful on a wide variety of sites using a variety of silvicultural systems. This past regeneration success provides a good assurance of successful restocking within five years for this project. Regeneration harvest is proposed for several stands in this project area (6,233 acres in Alt. 2, 6,198 acres in Alt. 3, and 5,955 acres in Alt. 4). Natural regeneration is expected to meet the requirements of the law, and supplemental planting of ponderosa pine and western larch is planned in some areas. Units planned for intermediate harvests and precommercial thinning (2,517 acres in Alt. 2, 2,371 acres in Alt. 3, and 2,024 acres in Alt. 4) would remain fully stocked after treatment.

Clearcutting and Even-Aged Management (16 U.S.C. 1604(g)(3)(F)(i))

When timber is to be harvested using an even-aged management system, a determination that the system is appropriate to meet the objectives and requirements of the Forest Plan must be made, and, where clearcutting is used, it must be determined to be the optimum method. All even-aged management proposed in the Hungry Ridge project is appropriate to meet the objectives and requirements of the Forest Plan. The silvicultural prescription of clearcut with reserves is the optimum treatment for the units in which it is proposed, because the species composition of the existing stands is at high risk for loss to insects or disease. The silvicultural prescriptions will further detail and clarify tree species at risk and the specific insect and disease vectors.

Forest Service Manual – Policy (FSM 2470.3) Regional Forester's Policy (USDA 2002a)

When timber production is emphasized in forest plans, silvicultural practices will ensure that stands achieve and maintain the level of stocking, species composition, and structure best-suited to meeting short- and long-term management objectives, including those addressing volume growth and yield. Broad-scale factors, such as how concepts of disturbance ecology complement or risk long-term sustainability of the resources managed, should be recognized prior to implementing silvicultural treatments.

When other resources are emphasized along with timber production, it is important that stocking, species composition, and stand structure, identified to meet short- and long-term resource management objectives, also be implementable and sustainable considering concepts of disturbance and forest ecology. Modification of desired stand composition and structure conditions should be done to complement landscape-level desired composition, structure, and function objectives.

Silvicultural practices must be ecologically sound. Treatments need not duplicate natural processes, but they must be compatible with the natural forces that create changes in the forest ecosystem.

Openings Larger Than 40 Acres

Direction in Forest Service Manual 2470, Region 1 Supplement #R1 2400-2016-1, Section 2471.1 states that the size of openings created by even-aged silvicultural treatments in the Northern Rockies will normally be 40 acres or less, with certain exceptions.

Implementation of Alternatives 2, 3, and 4 would create openings that are larger than 40 acres in size. Average residual tree stocking levels in these openings would vary from 0 - 30 trees per acre, depending on tree species and condition of individual trees. Snags and green-tree replacements should remain where available, based on Regional direction (Bollenbacher et al. 2009). The units themselves vary in size; however, some of them are adjacent to previously-harvested units. All of the previous harvest units have been successfully restocked, and are no longer considered to be forest openings. Thus, they do not add any additional acreage to the proposed units in Alternatives 2, 3, and 4. The following table displays the openings larger than 40 acres that would be created with the three action alternatives.

Proposed Harvest Unit	Alternative 2 Acres	Alternative 3 Acres	Alternative 4 Acres
21A	66	66	66
22	45	45	45
25	107	107	107
26	61	61	61
27	62	62	62
28	73	73	73
29	280	280	237
30	74	74	74
31C	156	156	156
33	42	42	42
34	45	45	--
35	92	92	92
36	585	585	585
37	354	354	354
39	115	115	115
41	64	64	64
44	147	147	54
46	66	66	66
47	44	44	44
48	228	228	228
49	116	116	116
50	360	360	333
51	148	148	148
53	45	45	45
57	60	60	60
58	76	76	76
59	246	246	246
60	149	148	148
62	276	254	254
63	46	46	46

65A	47	47	47
72	95	95	95
73	89	89	89
74	197	197	197
75	64	64	64
76	41	41	41
78	68	68	68
79	118	118	60
80	64	64	64
82	141	141	141
83	52	52	52
84	104	104	104
85	173	173	173
87	57	57	57
88B	188	188	188
Total:	5726	5703	5436

The proposed units in the table above do not meet the criteria for exception stated in the R1 supplement to Forest Service Manual 2470. Therefore, these units will need the Region 1 Forester's approval.

Interior Columbia Basin Scientific Assessment (a Nez Perce NF Planning Document)

The Interior Columbia Basin Scientific Assessment (Quigley et al., 1996) found that forest integrity was low in the South Fork Clearwater River subbasin, based on the reduction of early- and late-seral tree species, the change in tree size classes, and the disruption to fire regimes, among other factors. The Interior Columbia Basin Scientific Assessment categorized the Hungry Ridge project area as Forest Cluster 3, which has low forest integrity with the highest mean departures in fire frequency and severity, moderate road densities, and declining areas of late- and early-seral structures with increases in mid-seral structures (Quigley et al. 1996, pp. 96-115).

This project would initiate restoration of the factors leading to high forest integrity described in the **Interior Columbia Basin Scientific Assessment**. This restoration would enhance early- and late-seral tree species, transition size classes to be closer to their historic range of variability, and mimic historic fire regimes. Implementation of this project would not restore the whole South Fork Clearwater River subbasin; however, progress would be made by restoring 8,750 acres in Alternative 2, 8,569 acres in Alternative 3, and 7,988 acres in Alternative 4.

South Fork Clearwater River Landscape Assessment (SFLA)(a Nez Perce NF Planning Document)

The South Fork Clearwater Landscape Assessment (SFLA)(USDA Forest Service, 1998) characterizes the ecological and social conditions in the South Fork Clearwater River subbasin, and provides a context for future forest management decisions in the area. The assessment recommends vegetation themes for the Mill Creek Ecological Reporting Unit (ERU), which includes the Hungry Ridge analysis area. The recommended vegetation themes for the Mill Creek ERU are: 1) in VRU 1, restore landscape pattern and seral species in cool and harsh cold climates – whitebark and lodgepole pine, with lesser amounts of Engelmann spruce, Douglas-fir, and subalpine fir; 2) in VRUs 3 and 4, recover open and two-story stands dominated by medium and large ponderosa pine, with some Douglas-fir and western larch; and 3) in VRU 7, conserve existing vegetation conditions in cool, moist climates – lodgepole pine, Douglas-fir, and western larch on ridges, with grand fir, Engelmann spruce, subalpine fir, and Pacific yew on lower slopes or moist areas. More detailed descriptions of these themes are found in the SFLA.

This project addresses the recommended vegetative objectives described in the **South Fork Clearwater Landscape Assessment**. The project enhances ponderosa pine and other early-seral species in VRUs 1, 3, 4, and 7, reduces the risk of stand-replacement wildfire, and transitions the area to a more historic range of size classes, cover types, and stand densities. For descriptions detailing accomplishment of these objectives, see the environmental consequences sections for the vegetation indicators.

Short-term Uses and Long-Term Productivity

The National Environmental Policy Act requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

An evaluation of the relationship between the local short-term uses of the human environment and the maintenance and enhancement of long-term productivity discloses the trade-offs between short-term adverse impacts and long-term benefits of the proposed project. Short-term impacts, disruptions, and uses of the local environment may be worthwhile if there are long-term benefits to the environment resulting from the actions.

Short-term uses of and impacts on the local environment are associated with the project, and are listed below. These impacts could be minimized with the application of design and mitigation measures, as recommended in Chapter 2.

The short-term adverse effects that could be caused by the proposed project include:

- Increased use of FS Road #309 by log trucks during timber harvest operations, and increased noise in individual harvest units during harvesting

The long-term benefits to be gained through the implementation of the proposed project are numerous and have been detailed in the Direct, Indirect, and Cumulative Effects sections of this report.

Unavoidable Adverse Effects

For all of the alternatives (Alternatives 1-4), there would be no unavoidable adverse effects if any of these alternatives were implemented.

Irreversible and Irretrievable Commitments of Resources

For all of the alternatives (Alternatives 1-4), there would be no irreversible or irretrievable commitments of resources if any of these alternatives were implemented.

Oher Required Disclosures

There are no other required disclosures for the vegetation resource within the Hungry Ridge project.

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Signature: *<u>/s/ Joan Brown</u>* Date: <u>December 15, 2016; Updated 2/3/2017 and 4/12/2017</u>